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# Reviving the Vernacular Architecture of Gond Tribes of Gondia District -A Sustainable Case Study in Today's Context

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***Abstract : Each and every region all over the world has its own architecture developed through time, climate, topography and available resources. The vernacular architecture of a particular place has a peculiar characteristic and also reflects the above components. It is flourished and still proving its best in today's context as it is experimented and time tested. It's noteworthy to study the vernacular architecture for which the case study from Gondia district is being studied and analyzed to understand its unfolded aspects. The agro climatic zones were referred for studying the village of Gond tribe. Thus the paper will highlight the construction technology adopted and how the earth architecture of the place has proven itself sustainable in today's context.***

Keywords **Vernacular Architecture, Agro climatic Zones, Sustainable, Earth Architecture, Construction Techniques.**

## I Introduction

Vernacular is the term derived from the Latin word vernaculus, meaning "domestic, native and indigenous". Vernacular architecture is a term used to categorize methods of construction which use locally available resources and traditions to address local needs. Vernacular architecture tends to evolve over time to reflect the environmental, cultural and historical context in which it exists. It is an indigenous architecture with specific time or place (not imported or copied from elsewhere).In contrast to planned architecture by architects, the building knowledge in vernacular architecture is often transported by local traditions and is thus more - but not only - based on knowledge achieved by trial and error and often handed down through the generations rather than calculated on knowledge of geometry and physics. The Encyclopedia of Vernacular Architecture of the World defines vernacular architecture as:

*"...comprising the dwellings and all other buildings of the people. Related to their environmental contexts and available resources they are customarily owned- or community built, utilizing traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating the values, economies and ways of life of the cultures that produce them…*

People have different forms of shelter appropriate to different seasons and geographical locations. The development of different solutions in similar circumstances because of cultural influences is typical feature of vernacular architecture. Thus the case study chosen from Gondia district which comes in high rainfall zone as per Agro Climatic data of Vidarbha clearly reflect its distinct vernacular features. Study and analysis of these features in detail right from the geographical location till the natural resources available for construction and its technology would be the focus of this paper. Agro climatic zones were done on the basis of rainfall that region receives which affects the cropping pattern. As vernacular architecture deals with local materials available for the construction, the agricultural waste is considered as an important content of it. Natural resources like earth, stone, bamboo, timber are available for construction purpose.

Out of which earth is being extensively used for construction along with other materials which gives additional strength, improves it water resistance properties and enhances its appearance. Earth architecture developed in different regions reflects their social status their rituals and culture. The most important feature of earth architecture is its climate responsiveness. Different earth construction techniques were evolved depending upon the availability of materials, the soil type available and the additives or stabilizer used which comes from agricultural waste. Thus the earth architecture is considered as most sustainable architecture which is economical, environment friendly and fulfilling the society's expectations in all aspects. Through the study of the earth architecture of Gondi tribes of Gondia the paper aims to analyze it's social, economical and environmental sustainability.

Figure.1 Natural resources used for construction purpose in different regions

## II Methodology

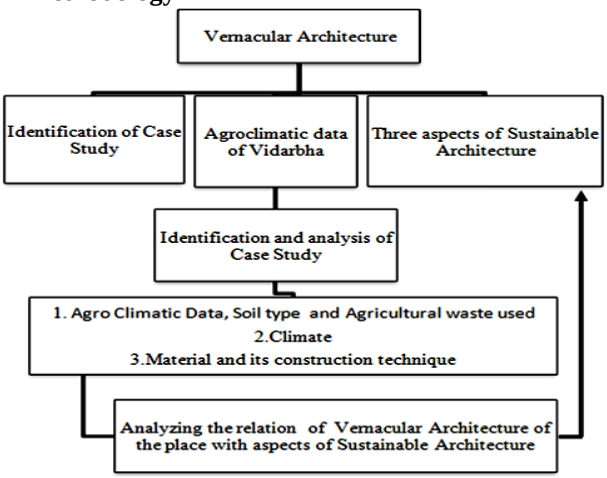


Figure 2 Methodology adopted for the study

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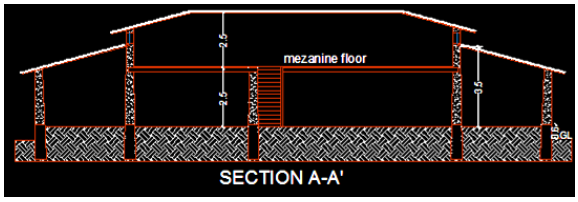
The methodology adopted for the study is well explained through the flow chart given below. (Fig 2) The study started with understanding the concepts of vernacular architecture and its relationship with the sustainability aspects in general. Agro climatic data of Vidarbha is referred to understand the rainfall of that region and the crops cultivated there, as the agricultural waste is being used as a binder along with other construction material. Soil map of India was further referred to study the soil type available at that region as different soil contains a different mineral which again reacts differently with binders or other component of the mix**.** The village was identified from specific taluka of the district Gondia.The criteria for choosing the village was maximum where 90% to 95% of houses were built out of mud and other natural resources. The case study was then analyzed based on the parameters like soil type, agricultural waste used, agro climatic data and natural construction material and its techniques. Finally the paper aims to analyze the relationship of vernacular architecture of the region with the aspects of sustainable architecture.

**III Agro climatic zones of Vidarbha (Fig 3)**
Vidarbha covers 11 districts and it is divided into four Agro Climatic zones based on the rain it receives annually as below.

a) **High rainfall zone - 1250mm to 1750mm**

b) Moderately high rainfall zone - 1076mm to 1460mm

c) 

Moderate rainfall zone - 900mm to 1200mm

d) Assured rainfall zone - 650mm to 700mm

The districts like Gondia, Bhandara, Gadchiroli and part of Chandrapur majorly Tadoba forest area of Vidharbha region lies in high rainfall zone

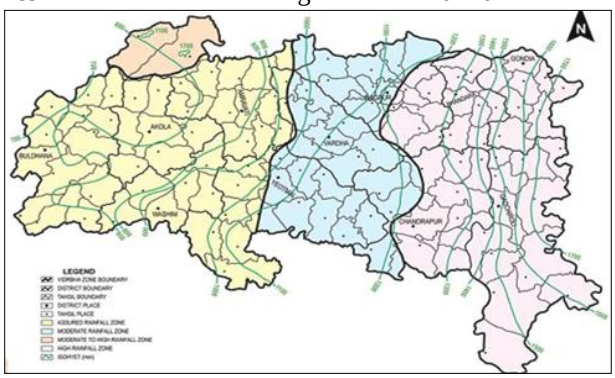


Figure 3 Agro climatic zones of Vidarbha

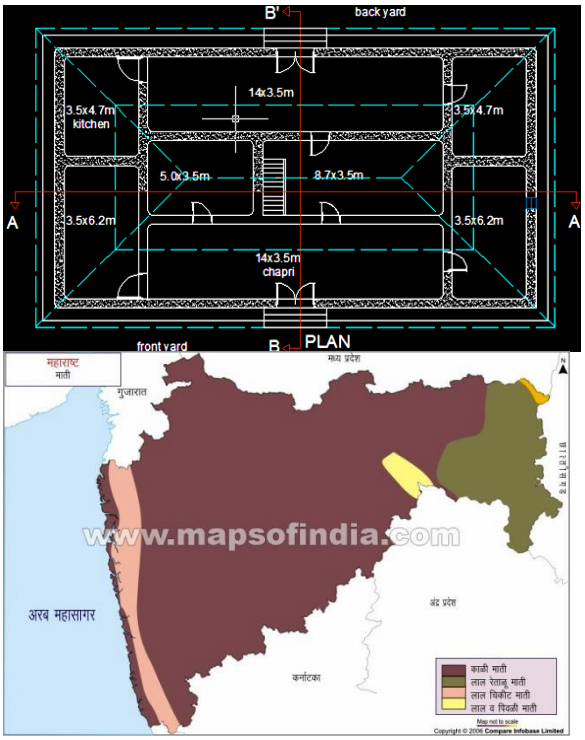


Figure 6 plan and section of the house

To understand the soil type available in the region the soil map of India was referred which showed the presence of the red and yellow soil in the chosen high rainfall zone. (Fig.4)As this zone receives high rainfall, rice is the major crop cultivated in the soil. July to October is the span when farmers sow the seed and in month of November they get the fully grown rice. The waste comes out of it is rice straw and rice bran which they used for the cattle and for
Figure 4 Soil map of Maharashtra
the construction purpose. Through the case study it is observed that the construction technique adopted, contained rice straw majorly which acts as a binder and provides reinforcement to the walls.

**IV Case study (High rainfall zone)**
Murkudandhari, Salekasa Taluka,District Gondia
Figure5 The residential unit and map of Gondia

The sample selected for the study was the representative residential module. Almost 95% of the houses were made out of mud. The place itself was carrying an interesting vernacular fabric. Typical sloping roof to cope up with heavy rainfall covered with red colored country tiles. Wall finished with mud plaster having colorful facades. The interior were so neatly maintain giving you the pleasant feeling. The spaces were crafted to fulfill their daily routine. Module basically consisted of Awar(front yard),chapri (drawing hall) ,sayapak ghar (kitchen),sleeping area, special store room for storing the grains and back yard acting as a kichen garden . The mezzanine floor created above the central space

provides the additional storage space for dried grains and vegetables (Fig.6). Each and every element was carved out so efficiently responding to the climate, environment and their social needs. Individual elements from foundation to roof are discussed further.

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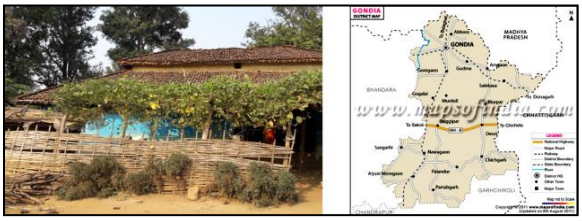


**Foundation -** Foundation started from two to two and a half feet below ground level. The width at the bottom was more (500 to 600 mm) and goes on reducing towards the upper floor that's why it was seen tapering towards top. Random rubble stone masonry was used up to one to one and two feet above ground level. Raised plinth was preferred to safeguard the bottom from rain water.

**Walling techniques -** Cob Wall technique was used for erecting the structure. Cob is the huge balls of mud with other additives elongated in shape to suit the measurement. The gaps within the cob were filled in the finishing layer and in plastering.

Composition- Cow dung, rice husk and local red soil (mud) in the ratio of 1:1:4 .The soil types available in this region are rich in iron ore and magnesium that's why available in red and yellow color. First layer of 0.30m. to 0.45m in width starts from first end finishing the outline of the house. The next layer was laid after the first get dried of. The width of the wall was maintained as it reaches the heights. The wall was plastered with the mixture of cow dung and mud.

Final layer of white soil and yellow soil available near by the village was put on the finished surface which acts like paint but allow the walls to breath.

**Plastering-** is done in single layer, a mixture of cow dung and mud in the ratio 1:2 in a 20 mm. thick layer was put on the mud wall which acts as a filler within the gaps of cob which was finally finished with white and yellow soil which gives the appearance of paints.

Figure 7 Thick wall, finished floor,wooden lintel and raised plinth of the house

The soil used as paint creates the glossy and soft surface which allows walling material to breathe and also protect the surface with the splash of water coming during rainy season.

Figure 8 Mezzanine floor, timber truss with country tiles and staircase made out of mud

**Mud Flooring**- The area to be floored is first filled with soil and murom taken out of trenches. Good quality Murom is available in Gondia which could be found after 1.2 m to 1.5m. It acts as a stabilizing agent for the soil. Finally layer of soil is then pressed and finished with layer of cow dung and mud slurry.

For mezzanine floors firstly the huge logs of trees especially teak wood from the forest was laid on walls which acts like a principal beam which takes the load. On top of that, layer of timber studs were provided which creates the cushion for the floor which was then filled with cow dung and mud mixture. Final coating of the slurry provides finished floors which were used for the storage purpose.Mezanine floors receives the sunlight from the small windows and the gaps left between sloping roof.

**Roof-** Pitched roof is very common in response to the climatic conditions. It is supported by timber truss and covered with the country tiles manufactured locally. The extended eves adds beauty to the vernacular character which protects the wall surface and plinth area from rain (Fig 8).

**Lintel door and window**

Openings are made out of timber. They are of a lower width and height so as to balance the load of the roof. Lintels are constructed out of locally available good

quality timber. Timber lintels swells when comes in contact with water results in damaging the structure so small width of window solve the problem up to certain extent providing minimal light inside. The door and window frame is fixed within the mud walls and then the shutters were hinged to the frames.

The wooden elements used within the structure must be well seasoned. Many a time's local treatment was also given to it which protects it from insects and termites.

**V Observations from the study.**

The study was conducted to understand the vernacular architecture of the region. Residential unit chosen was representative module of the village as ninety five percent houses were identical in plans and architectural details. The observations are listed below,

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1. Climate plays an important role as far as structural details are concern. The design and detailing are in response to the local climate of the place.
2. The natural resources like soil, agricultural waste available there was substantially explored and utilized which added to the environment sustainability.
3. required any investment but creative craftsmanship is essential as far as construction process is concern.
4. The village selected for the study was located in the interiors where mode of transportation is not easily available that's why the place is not reflecting any influence of urbanization.

**VI Conclusions**

Vernacular architecture is the architecture native to the place, build by the local craftsman's, and with local materials in response to the climate, topography and social set up of the community. The study was undertaken to comprehend the sustainability aspect of vernacular architecture and the study concluded as follows

i. The resources used for construction like soil, wood local stones, rice husk are naturally available and reusable, it can go back to the nature without harming the environment.
ii. The local soil, cow dung and agricultural waste are being used for foundation to wall. The cow dung and mud slurry is used for plastering the wall surfaces as well as floors.
iii. The natural timber available nearby is used for constructing trusses which act as a framework for roofing covered with local tiles.
iv. Natural and local availability of the materials makes it economical for the user but require skilled labor and craftsmanship.
v. The structure is totally climate responsive as the width of wall and the presence of cow dung and rice husk improves the insulation properties which results in better environmental comfort.
vi. The small windows though have the limitations of size provides less light but safeguard from the hot winds of summer.
vii. The extended eves protects the wall surface from rain water which reduces the mud erosion substantially. Raised plinth also helped the structure to resist the water absorption or percolation through foundation.

The vernacular construction techniques developed were time tested and proven best for the particular climate. There are certain loop wholes as the locally available soil is used as basic material .It has certain limitations but that can be overcome. Thus the above case study has given us the direct connect of all the aspects of sustainable architecture which was fulfilled by the vernacular architecture of high rainfall zone.

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